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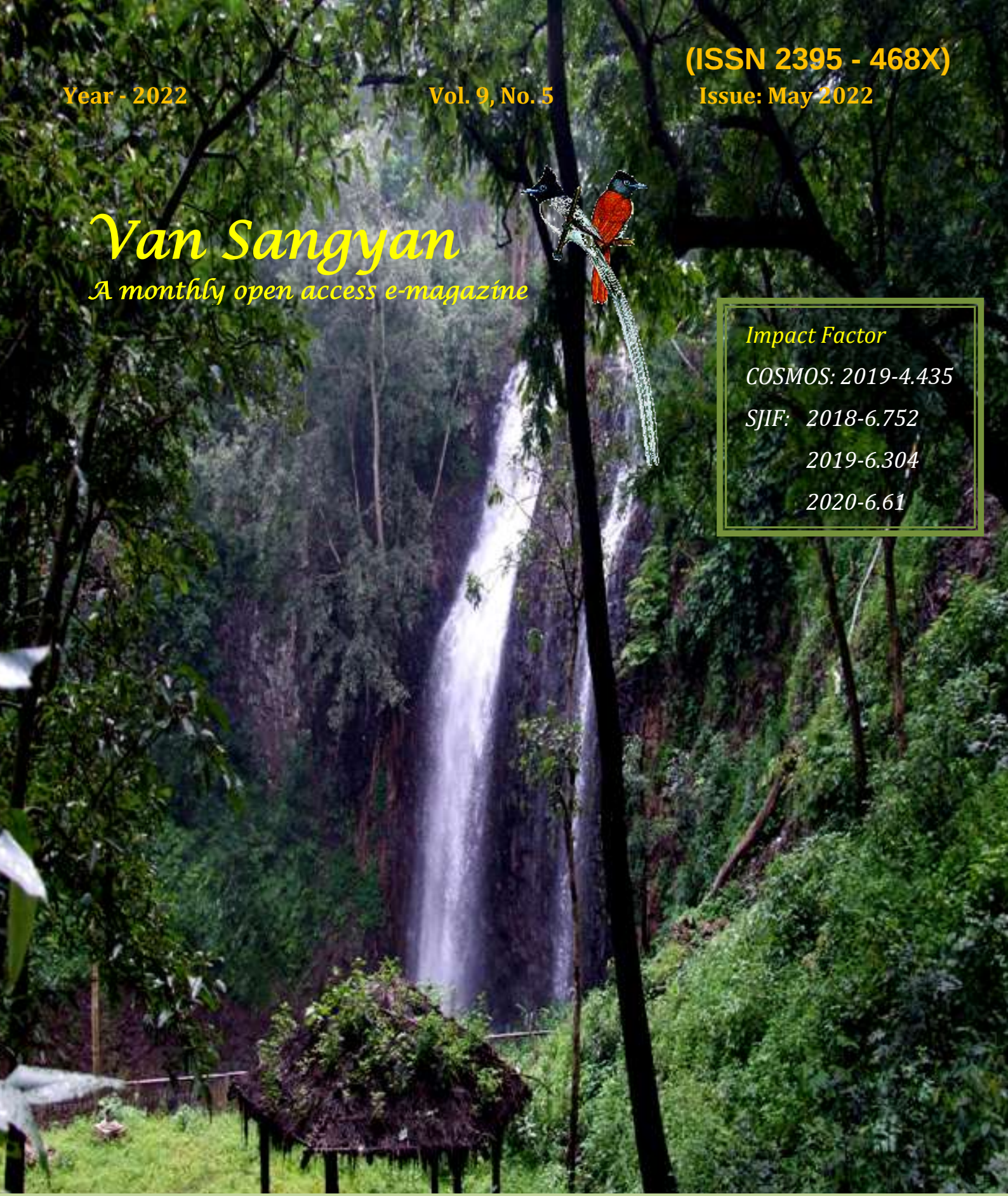

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Van Sangyan

Note to Authors:

We welcome the readers of Van Sangyan to write to us about their views and issues in forestry. Those who wish to share their knowledge and experiences can send them:

by e-mail to vansangyan_tfri@icfre.org

or, through post to The Editor, Van Sangyan,
Tropical Forest Research Institute,
PO-RFRC, Mandla Road,
Jabalpur (M.P.) - 482021.

The articles can be in English, Hindi, Marathi, Chhattisgarhi and Oriya, and should contain the writers name, designation and full postal address, including e-mail id and contact number. TFRI, Jabalpur houses experts from all fields of forestry who would be happy to answer reader's queries on various scientific issues. Your queries may be sent to The Editor, and the expert's reply to the same will be published in the next issue of Van Sangyan.

Cover Photo: Panoramic view of Achanakmar-Amarkantak Biosphere Reserve
Photo credit: Dr. N. Roychoudhury and Dr. Rajesh Kumar Mishra, TFRI, Jabalpur (M.P.)

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From the Editor's desk

Ecosystem services (ES) are all the benefits which human can derive from the natural ecosystems for their physical, social, and economic well-being Climate change, pollution, over-exploitation, and land-use change are some of the drivers of ecosystem loss, as well as resource challenges associated with globalization and urbanization. Land use change is an immediate issue in the United States. Today, the Nation is experiencing a loss of open space and a decline in forest health and biodiversity, particularly on private lands. Approximately 57% of all forestland in the United States, or 429 million acres, is privately owned. Non-industrial interests – families, organizations, and communities that own the land for the aesthetics and uses that forests provide or for income generated from the sale of forest products and services - own 85% of our private lands. Recent trends in parcelization and divestiture of private lands in the United States suggest that private landowners are commonly under economic pressures to sell their forest holdings. Rising property values, tax burdens, and global market competition are some of the factors that motivate landowners to sell their lands, often for development uses. The loss of healthy forests directly affects forest landowners, rural communities, and the economy. As private lands are developed, we also lose the life-supporting ecosystem services that forests provide.

Regulations, land acquisitions, conservation easements, and tax incentives are some of the conservation approaches that aim to protect and conserve the Nation's forests and grasslands. Over the past decade, advances in sustainable forest management and forest certification have complemented conservation objectives. Traditional conservation programs, however, may not be enough to safeguard natural landscapes and biodiversity, and traditional markets may not provide landowners with a sufficient economic incentive to own and sustainably manage forestland. To reverse the loss and degradation of ecosystem services, economic and financial motivations must include a conservation objective, and the value of ecosystem services needs to be incorporated into any decision-making.

Since ES provides a variety of benefits to human well-being, having a scientific output on ES can help to motivate policymakers to work towards reversing ecosystems from further degradation. Although human wellbeing is the core issue in ES, the existence of rapid population growth, economic growth, change in human consumption patterns, and climate change adversely affects the ES services.

In line with the above this issue of Van Sangyan contains an article on Ecosystem services provided by rangeland shrubs in Bundelkhand region. There are also useful articles viz. Bamboo seed propagation: Challenges and solutions, वर्ष 2021 में उष्णकटिबंधीय वनों की हानि, Overpopulation and its impact, Wetlands: Not wastelands, वन रोपणी एंव रोपण में व्हाइट ग्रब एवम् दीमक का प्रकोप एवं उसका नियंत्रण, सागौन वृक्षारोपण की तकनिकी जानकारी एवं आयसृजनका एक संभावित स्रोत and Perciana flavifusa - A major insect pest of Grewia optiva.

I hope that readers would find maximum information in this issue relevant and valuable to the sustainable management of forests. Van Sangyan welcomes articles, views and queries on various such issues in the field of forest science.

Looking forward to meet you all through forthcoming issues

Dr. Naseer Mohammad

Chief Editor

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Ecosystem services provided by rangeland shrubs in Bundelkhand region

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Abstract

Rangelands are diverse landscapes that support nearly one- third of the world's population and provide various ecosystem services to the society.In India these are spread over 12.15 million ha area.More than 40% of the large population of livestock still depend upon grazing in the rangelands on high altitudes, desert, semi-arid/arid areas.The shrubs provide number of ecosystem services likewise small timber, food, fodder, fuel wood, tan, dyes, fiber, ethno-medicine, live fences, windbreak, browsing reserves and fodder bank as a provisional service and climate regulation, water regulation, water purification, nutrient cycling and primary production are the supporting and regulating services whereas religious and aesthetic values are the cultural services. Theseshrubs are utilised for variety of purposes in Bundelkhand and a major bioresource for the livelihood options. Thus, shrubs need to be promoted for reducing the pressure on natural forest and to augment the green cover in the tropics of arid/semi-arid vis a vis increase resource base outside the forests for local population.

Keywords: Bundelkhand, Ecosystem services, Ethnomedicine, rangeland.

Introduction

Rangelands are diverse landscapes that support nearly one- third of the world's population and provide various ecosystem services to the society. These areas play a significant role in the conservation of the climate and soils, thus reducing the effects of desertification factors. It is estimated that rangelands store up to 30% of the world's soil carbon, in addition to the substantial amount of above-ground carbon stored in trees, bushes, shrubs and grasses (Neely et al. 2009).

Bundelkhand has degraded, undulated rocky land and constraints in arable farming, and mainly supports the growth of shrub vegetation diversity.The integration and augmentation of promising shrubs to rangeland in arid/semi-arid conditions can play important role in sustaining the rainfed and fragile ecosystem of Bundelkhand ecologically and economically.

Rangelands (Fig.1) of Bundelkhandcover about 5.5% area of the total geographical area with tropical mixed dry deciduous, scrub thorn forest and degraded grasslands. Bundelkhand lies within two of the major states *viz.* Uttar Pradesh and Madhya Pradesh.Bundelkhand of Uttar Pradesh spreading over of seven districts *viz.* Jhansi, Lalitpur, Jalaun, Hamirpur, Mahoba, Banda and Chitrakoot. Moreover, six districts in Madhya Pradesh namely

Sagar, Panna, Tikamgarh, Chhatarpur, Damoh and Datia. Most of the arable land in Bundelkhand is used in the field of grain and cash crops, which increases demand on depleted farmland for grass, forage, wood, and fuel wood. Degraded land also causes decreased plant cover leading to deterioration in composition and function of ecosystems.

Fig: 1 A rangeland from Bundelkhand, Uttar Pradesh

The shrubs improve the availability of ecosystem services like fodder, fuel, ethno-medicine and other non-wood products (Rathore *et al*. 2011). As an ecological function, shrubs increase soil fertility, water percolation, reduced soil erosion, surface runoff and create favourable conditions by improving the microclimate. Whereas religious and aesthetic values are the cultural services provided by shrubs.

Provisional ecosystem services provided by rangeland shrubs

Ecosystem services are the benefits people obtain from ecosystem and these become very popular in recent decade. According to Millennium Ecosystem Assessment (MEA, 2005) ecosystem services has been categorized in to four main categories.Raw products such as wood, fuelwood, fruits, fodder, gums and resins, fibers and floss, dyes etc. are provided by shrubs comes under provisional services. Intangible or non-material and unconsumed outputs of the shrub species which include aesthetic, artistic, spiritual, recreational, scientific and educational values are the cultural values whereas climate amelioration, maintenance of genetic pool, maintenance of gaseous balances mainly carbon dioxide and oxygen in the atmosphere are regulating and supporting ecosystem

services. Major 18 shrub species were identified out of total 34 shrubs majorly provides various provisional and ecological services in Bundelkhand (Table 1).

Food

There are eleven major edible shrubs in Bundelkhand namely; *Annona squamosa*, *Securinega virosa*, *Ziziphus oenoplea*, *Z. nummularia*, *Grewia asiatica*, *Opuntiadillenii*, *Capparis decidua*, *Carissa spinarum*, *Balanitesa egyptiaca*, *Bauhinia vahlii* and *Woodfordia fruticosa* (Kumar, 2019). A woody climber *Bauhinia vahlii* yields edible seeds used as pulses. Fruits of *Annona squamosa* are reportedly useful for eyes and indigestion problems.

Fuelwood and fodder

Shrubs are excellent browse species that can yield a considerable amount of forage for livestock during lean periods and famine (Singh *et al.*, 2015). More the shrubs have potential to grow in harsh environmental conditions on the lands where annual arable crops fail to grow. The shrub *Ehratia aspera*, *Vitex negundo*, *Ziziphus nummularia*, *Grewia flavescens*, *Buddleja asiatica*, *C. procera*, *Zizyphus oenoplea*are are the species which proved the fodder in rangelands of Bundelkhand (Palsaniya *et al*. 2008). The wood of all the shrubs like *Grewia asiatica*, *G. flavescens*, *Helicteres isora*, *Ixora pavetta*, *Annona squamosa*, *Woodfordia fruticosa*, *Vitex negundo* etc are used as fuel wood for cooking food in rural and peri-urban areas of India.

Medicine and ethno-medicine

Traditional medicine uses like roots of *Withania somnifera* are used in treatment of nervous disorders, tubercular glands, tumours and ulcer. Latex of *Calotropis procera* is used to expulsion of intestinal worms. The leaves and flowers of *Z. nummularia* are used in the treatment of asthma, eye disease and fruits in nausea, vomiting, purify blood, ulcer and wounds. Leaf, stem and roots of *Carissa spinarum*are used as antibacterial, antioxidant and anti-arthritic respectively. Leaves of *Indigofera tinctoria* applied in dog bite. The seed oil of *Vitex negundo*, leaves of *Adhatoda vasica*, *Annona squamosa*, fruit powder of *Helicteres isora* and root powder of *Asparagus racemosus*, administered to treat various disease in cattle. Stem and fruits of *Opuntia dilloni* are used in whooping cough, boils, ophthalmia and ripe fruits are given in gonorrhoea. Stem and leaves of *Barleria prionitis* are used in treatment of cancer (Panchal *et al.* 2018).

Gum and Resins

Gum is obtained from *Woodfordia fruticosa* similar to gum tragacanth (Oudhia, 2003). *Commiphera wightii* yields oleo-gum resin used as incense in religious ceremonies, perfumes and in pharmaceutical industries. The bast fibers obtained from stem bark of *Helecteris isora* and *Abutilon indicum* have used for the preparation of bio-composites, floor covers, carpets and numerous handicraft and home furnishing items.

Tans and Dyes

Tans and dyes are waste products for plants but for human, important economic products, which used in leather, dye, ink, and petroleum industries.Various types of dye is obtained from leaves and flowers of *Woodfordia fruticosa*, *Lawsonia inermis* tannin from roots of *Ziziphus nummularia* (Palsaniya*et al.* 2008).

Cultural services

Cultural services cover the intangible or non-material and unconsumed outputs of the shrub species. The flowers of *C. procera* and fruits of *Z. nummularia* are offered to lord Shiva on Monday during the Sravan month. Mythologically it is said that Lord Rama and Sita, during the vanvaas used to had the fruits of *Annona squamosa*. Still the people use the fruits and leaves of sitafal to worship Goddess Laxmi. Ker (*Capparis decidua*) can be seen growing near the temples and burial ground in Bundelkhand.

Regulating and supporting services

Regulating and supporting services are the ways shrubs are able to flourish under harsh conditions of heat, drought and poor soils by supporting morphological, physical or biochemical characteristics or plasticityand affect the human health and comfort. Various adaptations are found in these shrubs under high temperature and low humidity conditions of semi-arid environments viz. reduced transpiration through thick waxy coating in *Calotropis procera*, waxy cuticle of stem in *Opuntia dilleni* modification of leaves into spines, branches into needle in *Asparagus racemosus*, shedding of leaves in *Capparis decidua*, *Commiphora wightii*, extensive and deep root system that helps to absorb the moisture and nutrients from deeper layer of soil. Species *Biancaea decapetala* and *Lantana camara* formed thickets, which help in soil conservation (Negi *et al.* 2019).

Conclusion

The Bundelkhand region is in unique phyto-geographical position. There is rich plant diversity in respect of fodder plants as well as medicinal and other economic plants in rangelands of Bundelkhand. The shrubs provide number of ecosystem services likewise small timber, food, fodder, fuel wood, tan, dyes, fiber, ethno-medicine, live fences, windbreak, browsing reserves and fodder bank as a provisional service and climate regulation, water regulation, water purification, nutrient cycling and primary production are the supporting and regulating services whereas religious and aesthetic values are the cultural services. These shrub species can be planted well in both plantation and agroforestry; therefore, shrubs can be promoted not only for reducing the pressure on forest for ecosystem services but also to increasethe forest cover in the semi-arid tropics of Bundelkhand.

Table 1. List of shrub species found in Bundelkhand with their local names and utilization.

S N	Name of Species	Local Name	Family	ES
1	*Abutilon indicum* (L.) Sweet	Kanghi	Malvaceae	Medicine, Fiber, fuel
2	*Annona squamosa* L.	Sitafal	Annonaceae	Fruit, Medicine, fuel
3	*Asparagus racemosus* (Willd.) Oberm.	Satavar	Asparagaceae	Medicine
4	*Balanitesa egyptica* (L.)	Inguva, Hingot	Zygophyllaceae	Medicine,

				Fiber, fuel
5	*Barleria prionitis* L.	Bajradanti	Acanthaceae	Medicine. Hedge
7	*Buddleja asiatica* Lour.	Dhora	Scrophulariaceae	Fodder
8	*Biancaea decapetala* (Roth) Alston	Alai	Fabaceae	Fodder
9	*Calotropi sprocera* (Ait.) Ait. f.	Aak	Apocynaceae	Fiber
10	*Capparis decidua* (Forsk.) Pax	Kareel	Capparidaceae	Food, Fuel
11	*Carissa spinarum* L.	Karonda	Apocynaceae	Food, Bio-fencing
12	*Cassia auriculata* (L.) Roxb.	Avaram	Fabaceae	Tanning
13	*Clerodendrum phlomidis* L.f.	Inni	Lamiaceae	Medicine
14	*Commiphora wightii* (Arn.) Bhandari	Gugal	Burseracea	Medicinal, Biofencing
15	*Ehretia aspera* Willd.	Tambolia	Boraginaceae	Fodder, Fuel
16	*Euphorbia nivulia* Buch.-Ham.	Thuhar	Euphorbiaceae	Biofencing
18	*Grewia flavescence* Juss.	Gangeruva	Tiliaceae	Fodder, Fuel
19	*Grewia asiatica* L.	Falsa	Tiliaceae	Food, Fodder, Fuel
20	*Helicteres isora* L.	Marorfali	Malvaceae	Medicine, Fodder, Fuel
21	*Ixora pavetta*	Lokhandi	Rubiaceae	Medicine, Fuel
22	*Lantana camara* L.	Lantana	Verbinaceae	Fuel
23	*Maerua arenaria* Baill.	Marua	Capparidaceae	Medicine, Fodder

24	*Mimosa himalayana* Lam.	Ail	Fabaceae	Fodder, Fuel, Biofencing
25	*Nyctanthes arbor-tristis* L.	Siharu	Oleaceae	Medicine, Fuel
26	*Olax scandens* Roxb.	Dhanni	Olacaceae	Medicine
27	*Opuntia dilloni* Benson	Nagfani	Cactaceae	Biofencing
28	*Securinega virosa* (Roxb. ex willd.) Baill.	Sirki	Euphorbiaceae	Fodder, Fuel
29	*Syzygium salicifolium* (Wight.) J.Graham	Kathjamun	Myrtaceae	Medicine, Food, Fuel
30	*Vitex negundo* L.	Semaari	Verbinacea	Medicine
31	*Withania somnifera* (L.) Dunal	Ashwagandha	Solanaceae	Medicine
32	*Woodfordia fruticosa* Kurz.	Dhawai	Lythraceae	Food, Fodder, Dye, Fuel
33	*Zizyphus nummularia* (Burm.f.) Wight &Arn.	Beri	Rhamnaceae	Food, Fuel, Fodder, Tanning
34	*Zizyphus oenoplia* (L.) Mill.	Makai	Rhamnaceae	Fodder

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Bamboo seed propagation: Challenges and solutions

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Introduction

In this era of global warming and climate change, it is imperative for humanity to take earnest measures for mitigating human-made disasters. Scientists making the earth green by protecting forests and creating tree cover by planting more number of trees through all possible ways. But greening barren lands depends on the initiative of individuals, with the support of certain government schemes. Unless due importance is given for developing tree cover outside forest areas, we are destined to face the harsh realities of global warming and climate change. Considering the urgent need of greening, certain state forest departments and corporations are taking earnest measures for tree cultivation on private lands and establishing tree parks and oxygen parks. The rapid growth and tolerance for marginal land, make bamboo a good candidate for afforestation, carbon sequestration and climate change mitigation. Itbelong to the largest family of grasses, the Poaceae (Gramineae), and constitute the Bambusoideae subfamily. With 121 genera and 1662 species (Canavan*et al.*, 2016), it plays an important role in human life, mainly in terms of meeting the current economic, ecological, and human essential needs . Bamboo is versatile and has notable economic and cultural significance in South Asia, Southeast Asia, and East Asia, being used for building materials, as a food source, and as a raw product, and depicted often in arts, such as in bamboo paintings and bamboo working. About 80% of bamboo forest lands and species in the world are distributed across the Asian Pacific region. Several studies have shown that bamboos cultivated commercially are more renewable and sustainable than other woody plants. A current report (Grand View Research, 2020) stated that the global demand for bamboo is expected to reach revenue of USD 98.3 billion with a Computed Annual Growth Rate (CAGR) of 5% by 2025. The bamboo culm or pole is ideal as an inexpensive source of material for housing and construction, scaffolding, furniture, handicraft, banana props, fishpens, agricultural implements and carts, musical instruments, boat outrigger, pulp and paper manufacture, toys, industrial products such as bamboo tiles and plywood, and many more. It is commonly planted along river banks and waterways to hold the soil in place and to check soil erosion. The young shoots (dabong or tambo) of certain species are ideal for food either fresh or canned. Harvesting of culms can be started in 3-5 years. This is a clear advantage even over fast growing trees because of quick return of investments.

Current status of bamboo resources in India (ISFR, 2021)

In India bamboo is found naturally almost throughout the county except Kashmir region. India has about 125 indigenous and 11 exotic species of bamboo from 23 genera. The north eastern region of the country and west Bengal account for more

than 50 % of bamboo resources of the country. Other bamboo rich areas of the country are the Andaman & Nicobar Island, Chhattisgarh, Madhya Pradesh and western Ghats. The total bamboo bearing area of the country has been estimated to be 15.0 million ha. Madhya Pradesh has maximum bamboo bearing area of 1.84 mha followed by Arunachal Pradesh (1.57million ha), Maharashtra (1.35 million ha) and Odisha (1.12 million ha). As compared to the estimate of ISFR 2019, the total bamboo bearing area of ISFR 2021, has decreased by 1.06 million ha.*Bambusabalcooa*, *Bambusabambos*, *Bambusatulda*, *Dendrocalamushamiltonii*, and *Dendrocalamusstrictus* are the main economically important bamboo species of India (Yeasmin*et al.* 2015). In India, bamboo is also considered as an important economic resource for nearly 7.5 million bamboo artisans (Prabu, 2006). The economic value of total bamboo harvest in India is USD 0.30 billion (Mahapatra and Shrivastava, 2013) and its products have a potential export value amounting to USD 4.46 billion by 2025 (Mehra and Mehra, 2007). Human activities such as deforestation, industrialisation, and illegal extraction of bamboo, have resulted in the loss of natural bamboo resources (Roy *et al.*, 2014). Therefore, it is necessary to find cost-effective methods for large-scale propagation of bamboo for planting in new bamboo forests to reduce the existing gap between demand and supply. The National Bamboo Mission (India) envisages covering over 1.76 Lakh hectare areas through bamboo plantations. This will need over 70 million field plantable saplings to raise bamboo plantations. The emphasis of National Bamboo Mission (India) is on an area based regionally differentiated strategy, for both forest and non-forest areas. Besides ensuring proper post harvest storage and treatment facilities, marketing and export, National Bamboo Mission (India) is committed to assure appropriate returns to growers/producers.

Bamboo propagation

There are basically three methods of propagating bamboo, which include taking cuttings from the rhizomatous roots, taking cuttings from young culms (stems), and growing directly from seed.

Propagating bamboo by vegetative means

In the vast majority of cases, root cuttings are going to be the fastest and easiest way to propagate bamboo. In nature, bamboo's most effective method of propagation and renewal is by way of underground expansion. In other words, the roots spread out, and as they do so, they continually produce new shoots which quickly grow into towering poles. Not only is this bamboo's most effective natural strategy, but industrious gardeners can also hijack the technique for themselves. But before you start digging, it's important to recognize the distinction between running bamboo and clumping bamboo. Runners have long rhizomes that grow parallel to the ground and outward, away from the main plant. As they expand, roots will grow out from the nodes of the rhizomes, and eventually the rhizomes will send fresh shoots growing upward. Clumping bamboos, on the other hand, have compact root systems, in which the rhizomes curve upwards and tend to produce new shoots close together, right next to the main plant. It will be a lot easier to propagate bamboo from a running rhizome than a clumping

one, but it can be done with either. If you have a running bamboo, you will probably realize, at some point, that the plant has an unstoppable urge to spread, and you have more than enough rhizomes to work with. As part of maintaining your bamboo, you probably need to dig into the soil periodically to cut back the rhizomes, if it's in the ground. If it's in a pot, you'll need to transplant the bamboo every so often, and divide the root ball into smaller units when you do so.

Rural people generally cultivate this plant by offsets and rhizomes. For large-scale plantations these methods are not economic due to scarcity of planting materials and transport costs, which are high because of the bulkiness of the materials. In the past, people tried other vegetative methods, such as culm segments, branch cuttings, ground and air layering, etc. But in all cases, the success was poor. Failure might have been due to inadequate knowledge of the propagating materials. It is pointed out that the age, nature, and the location of propagating material should be considered for better success. Development of roots and rhizome in propagating materials probably ensures success in bamboo plantation. This condition might be achieved by manipulation of the internal physiologic and external ecologic condition of the planting material.

Seed propagation

Some species do not produce seed (eg. *Bambusabalcooa ,Bambusa vulgaris*) and those which do so often flower at long intervals varying from30 to 70 years (e.g. *Bambusabambos, B polymorpha , Dendrocalamusstrictus, Melocannbaaccifea and Phyllostachy spp.).* Some species flower gregariously and then the parent plants all die, some flower sporadically with or without parent plant deaths, and some species combine both patterns (e.g. *B. tulda, B. longispicutata*). In only a few is there more frequent flowering and seed production (eg *Ochlandra spp*.). These flowering patterns mean that seed is rarely, if ever, available when it is needed for propagation. Also bamboo seeds tend to be relatively short-lived and difficult to store without sophisticated controlled drying and sealing in hermetic containers, techniques not available outside research institutions. Conventionally, bamboos are propagated through seeds. Short seed viability periods of 3–6 months, long-term gregarious flowering, the monocarpic nature of the plant, poor seed set and large-scale seed consumption by pests are all factors that restrict the use of seeds as a reliable resource of propagation. Owing to the segregation of their traits, the genetic homogeneity of seed-based progenies is also in question. The problem with bamboo seeds begins at the flowering stage. Unlike most plants, which flower on an annual basis, bamboo's biological clock ticks at a much different pace. Depending on the species, some bamboo can take a few decades to flower. Some species of bamboo can take as long as 120 years to flower and go to seed. Certain members of the genus *Phyllostachys*, like Moso and Madake bamboo, actually take more than a century to flower. In many cases, all members of given species will bloom at the same time, in what's called synchronous or gregarious flowering. And in most cases, the bamboo dies after it flowers, the way annual plants and flowers do. So if it flowers gregariously, that means all the plants will die at once.

Therefore, it's very important to gather those seeds. Then there's the challenge of storing and keeping track of the seeds for the next century. If you're collecting seeds from a plant that flowers once every 50 or 100 years, then you need a pretty good system for storing and organizing them. Over the decades and between the generations, it's easy to lose track. It's impossible to recognize a bamboo species by its seed, so accuracy is another thorny issue. The good news is that a well-established grove of bamboo can produce a prodigious quantity of seed. But then they must be properly dried, stored and identified.In certain species, like *Bambusa balcooa*, the plants do not produce fertile, viable seeds. So collecting them is somewhat useless. Given the scarcity of bamboo seeds and the difficulty of collecting them, suppliers can charge a steep price.

Solutions

Propagation by seed is hindered because it is unavailable for long intervals. Seeds are difficult to find, and slow to take off, but the results can certainly be rewarding. Besides normal flowering, bamboo sometimes may undergo out-of-phase flowering. Out-of-phase flowering is identifiable, as it only occurs in small areas or in a few clumps. It is important because it makes seed available between the normal seeding cycles. Plants originating from out-of-phase seed may be termed varieties. These varieties are expected to maintain the same length of seeding cycle as the species but to flower at different times. This hypothesis can be confirmed at the next flowering of such varieties. The varieties could be physiologically or genetically evolved. If all the out-of phase varieties were collected and planted in one place, seed could be available every year or after short intervals, at least, for a few bamboo species. International and zonal cooperation in creating seed-producing centers is needed and this could be achieved through international "varietal" seed exchange and regular scientific communications. Early flowering of seedlings may provide material for hybridization with species of normal-flowering patterns.

Seed enhancement technologies, such as pre-sowing, pre-storage, and mid-storage treatments, are the conventional approaches that are used widely in present-day seed science and technology. Pre-sowing treatments are performed to break dormancy, improve germination, and for precision sowing of seeds. Pre-storage and mid-storage treatments are generally applied to enhance or maintain the viability and vigour of seeds during storage (Fig-1). Application of these technologies can enhance the viability and storability issue of bamboo seed.

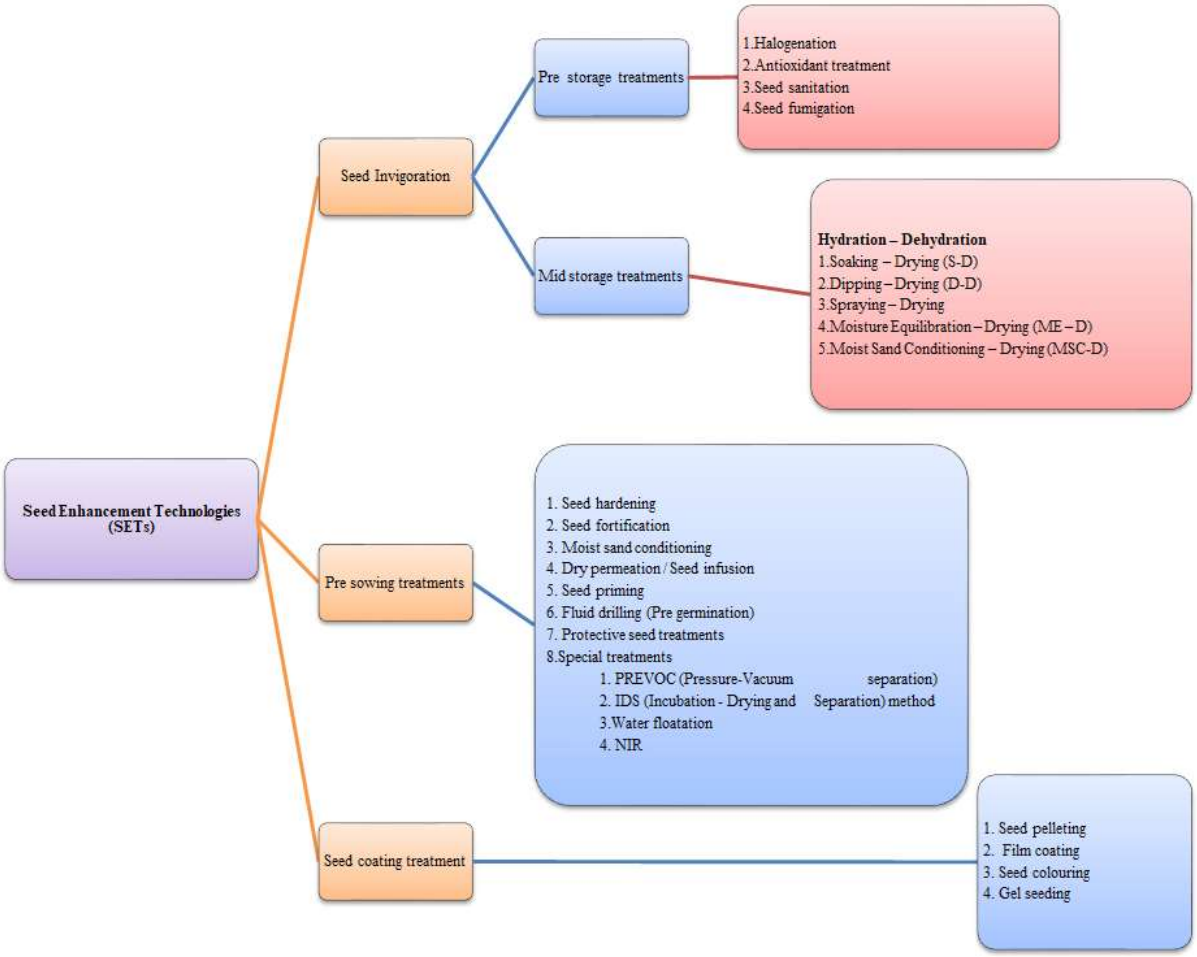

Fig-1: Different types of Seed quality Enhancement Technologies that can be applied on Bamboo seed quality maintenance and upgradation

Conclusion and future perspectives

Although bamboo has been called "the poor man's timber" and is associated mainly with the poor, there is no reason why there should not be a change in perception. Application of science and technology can provide further options in the use of bamboo. Bamboo could replace wood and steel in some uses with the right approach in R&D. There is need for a paradigm shift, for increased options in R&D, in both basic and applied -research, and ultimately in our economic development. When compared with other produce such as rice, potato or corn, the amount of funds spent for bamboo R&D is minuscule. There needs to be a greater infusion of funds and resources for R&D in bamboo. Collection of out-of-phase seeding varieties is one possible means for overcoming bamboo-seed rarity. Regional cooperation in this regard is essential so that seed-production centers can be built up for bamboo in each country. Use of SETs to enhance the seed viability, longevity and quality of bamboo seed may further help in protecting the diversity of bamboo and area under seed propagation.

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वर्ष 2021 में उष्णकटिबंधीय वनों की हानि

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दुनिया भर में लगभग 11.1 मिलियन हेक्टेयर जंगल मुख्य रूप से अवैध कटाई और आग से नष्ट हो गये थे। जिनमें से कुछ जानबूझ कर जमीन साफ करने के लिए लगाई गई आग और कई जलवायु परिवर्तन के कारण थे। ये वर्ल्ड रिसोर्स संस्थान (WRI) की ग्लोबल फॉरेस्ट वॉच अथवा युनिवर्सिटी ऑफ मैरीलैण्ड (UMD) द्वारा संयुक्त रूप से किये गये एक हालिया (2022) अध्ययन के निष्कर्ष हैं।

हालांकि नुकसान वर्ष 2020 की तुलना में कम गंभीर था, लेकिन उष्णकटिबंधीय क्षेत्रों में वनों की कटाई अभी भी खतरनाक दर से हो रही है। खोय हुए क्षेत्रों में से 3.75 मिलियन हेक्टेयर प्राथमिक उष्णकटिबंधीय वन थे। उन्हें अक्षत वन भी कहा जाता है।इन जंगलों में भारी मात्रा में कार्बन जमा होता है, और जब इन जंगलों को काट दिया जाता है या जला दिया जाता है, तो वे वातावरण में कार्बन डाइऑक्साइड छोड़ते हैं। यह भूमण्डलीय उष्मीकरण (global warming) को बढ़ाने में योगदान देता है । पिछले साल केवल प्राथमिक उष्णकटिबंधीय वन के विनाश से लगभग 2.5 गीगाटन कार्बन डायऑक्साइड (CO_2) वायुमण्डल में उत्सर्जित हुई थी।

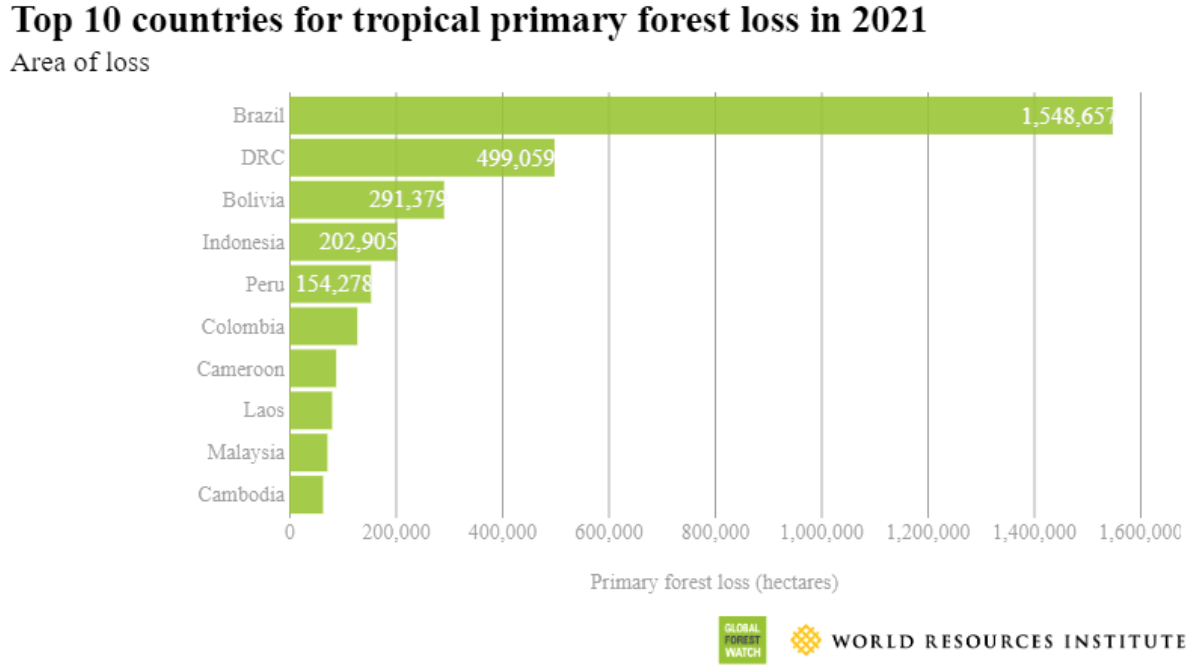
वास्तव में उष्णकटिबंधीय वन वैष्विक जलवायु प्रणाली का हिस्सा है। वे न केवल कार्बन का भण्डारण करते हैं, बल्कि ऊर्जा हस्तांतरण और वातावरण की नमी सामग्री को भी प्रभावित करते हैं, जो वर्षा और वैष्विक वायुमण्डलीय परिसंरचना पैटर्न को प्रभावित करते हैं।

हाल ही में आग के कारण उष्णकटिबंधीय जंगलों का विनाष तेजी से हो रहा है। कई वैज्ञानिक अध्ययन बताते हैं कि वनों की कटाई और जलवायु परिवर्तन के बीच एक जटिल प्रभाव है। जब वनों की कटाई या आग के कारण वन नष्ट होते हैं तो यह न केवल वातावरण में कार्बन को छोड़ देते हैं, बल्कि वर्षा के प्रतिमान को भी बाधित करते हैं, और स्थानीय तापमान को बढ़ाते हैं।

WRI और UMD द्वारा यह अध्ययन उच्च रिजॉल्यूशन उपग्रह इमेजरी का उपयोग करके किया गया था, जिसमें उष्णकटिबंधीय जंगलों का विश्लेषण किया गया, विशेष रूप से ऐसे देशों में

जहां वनों की कटाई आमतौर पर अधिक होती है, जैसे कि ब्राजील, इण्डोनेशिया और डेमोक्रेटिक रिपब्लिक ऑफ कांगों (DRC) आदि।

पिछले साल 40 प्रतिशत से अधिक वनों की हानि ब्राजील में हुई थी। लगभग 1.5 मिलियन हेक्टेयर तीन गुणा अधिक हैं, जिसने जंगल की दूसरी सबसे ज्यादा मात्रा खो दी। ब्राजील में बड़े पैमाने



जंगल को मानचित्र से मिटा दिया गया, इनमें से ज्यादातर अमेजॉन से थी। यह आंकड़ा DRC से पर वनों की कटाई का कारण कृषि विस्तार है, जिसमें वास्तव में वर्ष 2020 और 2021 के बीच 9 प्रतिशत की वृद्धि हुई है।

दक्षिण अमेरिका का अमेजॉन वन दुनिया का सबसे बड़ा वर्षा वन है और यह जैव विविधता में महत्वपूर्ण भूमिका निभाता है, जलवायु को नियंत्रित करता है, और वहां रहने वाले लाखों लोगों को पारिस्थितिकी तंत्र सेवाएं प्रदान करता है। अमेजॉन के जंगलों के बारे में की गई एक अध्ययन में चेतावनी दी गयी है कि वनों का नुकसान अमेजॉन को एक खतरनाक स्थिति की ओर धकेल रहा है। जहां यह अब दुनिया के सबसे महत्वपूर्ण कार्बन सिंक के रूप में काम नहीं कर पायेगा, बदले में कार्बन डायऑक्साइड (CO_2) का उत्सर्जक बन सकता है। यदि वनों का नुकसान उस खतरनाक स्थिति तक पहुंच जाता है, तो 2015 को पैरिस समझौते में निर्धारित विश्व तापमान को पूर्व औद्योगिक स्तरों से 1.5 से 2 डिग्री सेल्सियस ऊपर रखने के विष्व के प्रयास विफल हो जाएंगे।

दूसरी ओर इण्डोनेशिया और मलेशिया जैसे उष्णकटिबंधीय देशों में, जहां दशकों से बड़े पैमाने पर वनों की कटाई हुई थी, पिछले पांच वर्षों में वार्षिक वृक्षों के नुकसान की मात्रा में कमी देखी गई है। इण्डोनेशिया में पिछले साल खोए हुए वनों की मात्रा में 25 प्रतिशत की गिरावट आई है। मलेशिया, हालांकि वर्ष 2001 से अपने प्राथमिक उष्णकटिबंधीय वन का पांचवा हिस्सा पहले ही खो चुका है और वर्ष 1970 के बाद से एक तिहाई हिस्सा खो चुका है।

यह व्यापक रूप से बताया गया है की, इण्डोनेशिया की सफलता आंशिक रूप से प्राथमिक वनों और पीटलैण्ड के लिए लॉगिंग लाइसेंस पर सरकार की रोक के साथ साथ बेहतर अग्नि निगरानी के कारण थी। NDPE नामक एक नीति -'No Deforestation' कोई वनों की कटाई नहीं, 'No Peatland' कोई पीटलैण्ड न हो, 'No Exploitation' कोई षोषण नही- अब इण्डोनेशिया और मलेशिया में 80 प्रतिशत से अधिक पाम आयल शोधन क्षमता और इण्डोनेशिया में लुगदी और कागज उद्योग के 80 प्रतिशत से अधिक पर लागू होती है।

शीतोष्ण वनों के परिदृश्य

ऐसा नहीं है कि केवलउष्णकटिबंधीय वनों का ही नुकसान हो राहा है। रूस, कनाडा और अलॉस्का सहित विशेष रूप से ठंडे मौसम में पाये जाने वाले बोरियल जंगलों में पिछले साल रिकार्ड पर पेड़ के आवरण का सबसे अधिक नुकसान हुआ है। 8 मिलियन हेक्टेयर से अधिक का नुकसान हुआ था, और वर्ष 2020 की तुलना में लगभग एक तिहाई की वृद्धि हुई। मुख्य रूप से रूस ने गंभीर जंगल की आग का अनुभव किया जिसमें लगभग 6.5 मिलियन हेक्टेयर वन आवरण खो गया।

2030 तक शून्य वनों की कटाई

नवम्बर, 2021 के दौरान ग्लासगो में आयोजित हाल ही में COP-26 व जलवायू शिखर सम्मेलन में देशों ने ग्लासगो जलवायु संधि (Glasgow Climate Pact) को अपनाया जिसके माध्यम से

दुनिया भर के देशों ने अगले दशक के भीतर जंगलों को बचाने के लिए एक महत्वपूर्ण जलवायु संकट की घोषणा की। इसका मुख्य उद्धेश्य 2030 तक वनों कीकटाई को शून्य करना है।

वास्तव में इसे प्राप्त करने के लिए वन हानि की वर्तमान दर में बहुत तेजी से गिरावट की आवष्यकता है। अगर हम इण्डोनेशिया जैसे देशों को देखें तो अभी भी उम्मीद है। प्राथमिक वन हानि में इण्डोनेशिया की तेजी से कमी को एक बड़ी उपलब्धि के रूप में पहचाना जाना चाहिए, जिसकी संभावना पांच साल पहले तक सोचना भी मुश्किल था। दुनिया भर में इस प्रकार की वन कटाई में गिरावट हासिल करना आसान नहीं होगा। नवंबर, 2021 में WRI द्वारा किए गये एक पूर्व विश्लेषण में बताया गया है कि ग्लासगो संधि के सभी हस्ताक्षरकर्त्ता देशों में 2030 तक वनों की कटाई को प्रभावी ढंग से रोकने से 33 मिलियन हेक्टेयर वन हानि से बचा जा सकेगा। यह 19 गीगाटन कार्बन डाइऑक्साइड समकक्ष के उत्सर्जन से भी बच जाएगा।

पाम आयल की बढ़ती कीमतों के बीच इण्डोनेशिया और मलेशिया के वनों की रक्षा पर गति बनाए रखने की आवष्यकता होगी। ब्राजील और अमेजॉन के अन्य देशों को वनों की कटाई के नये स्थानों को रोकने होगी। कांगो बेसिन देशों को वनों की रक्षा करने वाले विकास के पथ सुनिश्चित करने होंगे, और रूस और अन्य उत्तरी देशों को वनों पर जलवायु परिवर्तन के प्रभावों का मुकाबला आवश्यक रूप से करने होगी।

वनों की रक्षा के लिए प्रोत्साहन की आवश्यकता

ग्लासगो संधि का समर्थन सार्वजनिक निधियों से 12 अरब डॉलर और निजी वित्तपोषण से 7.2 अरब डॉलर स्वदेशी लोगों और स्थानीय समुदायों के भूमि अधिकारों का समर्थन करने और वन रक्षक के रूप में उनकी भूमिकाओं का समर्थन करने के लिए उपयोग किया जाएगा। दुनिया की 30 से अधिक सबसे बड़ी वित्तीय कंपनियों ने भी वन की कटाई से जुड़ी गतिविधियों में निवेश को समाप्त करने का वादा किया है, और कांगो बेसिन में दुनिया के दूसरे सबसे बड़े उष्णकटिबंधीय वर्षावन की रक्षा के लिए 1.1 अरब पाउण्ड का फंड स्थापित किया जा रहा है।

वर्तमान में दुनिया का एक साझा लक्ष्य जंगलों की रक्षा करना और जंगलों को पुनर्स्थापित करने के लिए राशि इकट्ठा करना है। इन प्रतिबद्धताओं को हासिल करने के रास्ते चुनौतीपूर्ण है। हमें इंतजार करना होगा और देखना होगा कि यह कैसे आगे बढ़ता है।

संदर्भ

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Overpopulation and its impact

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Abstract

Overpopulation is a worldwide problem. It occurs when the needs of the people exceeds the carrying capacity of the resources of an environment in terms of food availability, water supply, environmental conditions and living space. In the present article we have discussed the causes and effects of overpopulation in India.

Introduction

The word population has its origin in the Latin word populus meaning 'people'. A population is a summation of all the organisms of the same group or species, which live in a particular geographical area, and have the capability of interbreeding. In ecology, population is defined as the total number of all individuals of a particular species, which breed among themselves or have the potentiality to do so, in a specific geographical area functioning as a unit of biotic community. Population is also described as the number of people in an area based on specific categories such as ethnicity, age, income, sex, and social economic status. Population is continually changing due to birth and death rate and relocation among families to explore good sources of income. Population is calculated by counting the actual number of people in a given area and measuring birth to death ratios. Population Growth can be defined as the change in population over time and can be quantified as the change in number of individuals in a population as "per unit time". Population is a dynamic unit. Number of individuals may increase or decrease due to many factors due to birth rate, death rate, migration etc. There are five main characteristics of a population and these include population size, population density, population distribution, age structure and reproductive base. These characteristics of a population can be found in population ecology, which is a combination of the study of how organisms interact with each other and their environment focusing on the group of individuals of the same species, most often humans in population ecology, who live in a given area.

Overpopulation is generally defined as an inability of the environment to support the existing population of humans or other living things. It is an undesirable condition where the number of existing human population exceeds the carrying capacity of Earth. The carrying capacity of a biological species in an environment is the maximum population size of the species that the environment can sustain

indefinitely, given the food, habitat, water, and other necessities available in the environment (Hui 2006). The carrying capacity of an environment may vary for different species and may change over time due to a variety of factors, including: food availability, water supply, environmental conditions and living space (Sayre 2008). It is a function of the number of individuals compared to the relevant resources, such as the water and essential nutrients they need to survive. Overpopulation occurs when the needs of population exceed the resources of national boundaries. Standard of living is the key to the issue of carrying capacity of natural resources to support the size of human populations. Developed countries' consumption per person is ten times greater than developing countries' consumption. The United States alone consumes 35% of the world's total resources but has only 6% of the world's population (Payne 1988). An area will be overpopulated when its population cannot be maintained without rapidly depleting nonrenewable resources or converting renewable resources into nonrenewable ones and without degrading the capacity of the environment to support the population. In short, if the long-term carrying capacity of an area is clearly being degraded by its current human occupants that area is overpopulated (Ehrlich and Ehrlich 1990). Overpopulation does not depend only on the size or density of the population, but on the ratio of population to available sustainable resources. It also depends on how resources are managed and distributed throughout the population. There are various degrees of overpopulation. *Absolute overpopulation* means that the living things have exceeded their ability to sustain their existence. As a result, the population typically destroys its environment and starves to death. By contrast, *relative overpopulation* is a situation when resources become scarce. As a result, each individual has less living space, or fewer available resources, or reduced quality of life. Overpopulation in developing countries is defined as uncontrolled population growth. Overpopulation in developed countries is the problem of increased resource use per capita. Overpopulation is caused by number of factors. Reduced mortality rate, better medical facilities, depletion of precious resources are few of the causes which results in overpopulation. It is possible for a sparsely populated area to become densely populated if it is not able to sustain life. The list of problems this is causing, or at least complicating, is a long one. It includes shortages of all our resources, war and social conflict, limits on personal freedom, overcrowding and the health and survival of other species. It is among the most pressing environmental issues, silently aggravating the forces behind global warming, environmental pollution, habitat loss, the sixth mass extinction, intensive farming practices and the consumption of finite natural resources, such as fresh water, arable land and fossil fuels, at speeds faster than their rate of regeneration. However, ecological issues are just the beginning.

Population growth

The human population has been growing continuously since the end of the Black Death, around the year 1350, although the most significant increase has been in the last 50 years, mainly due to medical advancements and increases in agricultural productivity. The Earth’s human

population did not pass the 1 billion mark until 1800; it then took 127 years to double to 2 billion (in 1927), then 47 years to double to 4 billion (in 1974), and has now exceeded 7 billion. As of January 31, 2016 the world's human population is estimated to be 7.3 billion by the United States Census Bureau, and over 7 billion by the United Nations. According to projections, the world population will continue to grow until at least 2050, with the population reaching 9 billion in 2040, and some predictions putting the population in 2050 as high as 11 billion. The growth of the world's population has already impacted sustainability, urbanization, health, inequality, poverty and global warming and research says it is likely the population will continue to swell throughout this century.

Global population growth*

Years passed	Year	Population in billion
--	1800	1
127	1927	2
33	1960	3
14	1974	4
13	1987	5
12	1999	6
12	2011	7
14	2025	8
18	2043	9
40	2083	10

*** Source :** Wikipedia 2016

Projected growth of the world's most populous countries

Continent	Projected 2050 population
Africa	1.8 billion
Asia	5.3 billion
Europe	628 million
Latin America & Caribbean	809 million
North America	329 million

According to the Indian census, carried out in 2011, the population of India was exactly 1,210,193,422, which means India has crossed the 1-billion mark. This is the second most populous country of the world after China and the various studies have projected that India will be world's number-1 populous country, surpassing China, by 2025 at 1.4 billion. Despite a continuing decline in fertility rate, India's population may not stabilize until 2050 or later. .Inspite of the fact that the population policies, family planning and welfare programmes undertaken by the Govt. of India have led to a continuous decrease in the fertility rate, yet the actual stabilization of population can take place only by 2050.

The two main common causes leading to over population in India are:

- The birth rate is still higher than the death rate. We have been successful in declining the death rates but the same cannot be said for birth rates.
- The fertility rate due to the population policies and other measures has been falling but even then it is much higher compared to other countries.

Effects of over population in India

Even after 69 years of independence, the scenario of our country is not good, due to over population. Some major impacts of high population are as follows:

Unemployment

Overpopulation is not the number of people, but rather the number of people/in comparison to the resources they need to survive. In other words, a ratio — population number: resource amount. Resources include: clean water, food, shelter, warmth, and cultivable land. Other lesser resources include: jobs, money, education, fuel, power, medicine, proper sewage and garbage management, and transportation. Generating employment for a huge population in a country like India is very difficult. The number of illiterate persons increases every year. Unemployment rate is thus showing an increasing trend. Children are working in hazardous export oriented industries like fireworks, match works, electroplating, beedi rolling, glass blowing, brassware, lock making, glass blowing, lead mining and stone quarrying amongst several others. These are places that have a severe negative impact on the health of anyone working there.

Manpower utilization

Another issue is how to use manpower. Better educated manpower seeks for occupations of greater status, which are opened up by the new development efforts. Because of its capital intensive nature, the ability, of the new economy for employment generation becomes limited. Concurrently, it renders many of the old occupations out of day and redundant. As a result, under-employment and unemployment, including unemployment of educated persons, increases. The number of jobless people is on the rise in India due to economic depression and slow business development and expansion activities.

Pressure on infrastructure

Development of infrastructural facilities is unfortunately not keeping pace with the growth of population. Due to population explosion, numerous facilities such as housing, transportation, health care, and education become insufficient. The worst symptoms of overcrowding in every aspect

of living conditions are manifested in the urban areas.

Resource utilization

Land areas, water resources, forests are over exploited. There is also scarcity of resources. This results in deforestation and desertification with permanent damage to the renewable resources.

Food production and increased costs

Due to increase in population, the cost of production of the basic necessities of life, such as food, increases. While India's grain reserves remain ample, domestic food prices in India have increased at a double-digit rate, straining the budgets of the urban poor. Inflation is the major consequence of over population. India's farmers face falling water levels, declining runoff from melting glaciers, loss of farmland to urbanization, the effects of climate change, and the ever rising price of fuel and fertilizer.

Inequitable income distribution

In the face of an increasing population, there is an unequal distribution of income and inequalities within the country widen. Population growth in uneven manner can lead to unbalanced distribution of salary. Both at the international and national levels, income inequality increased.

Air Pollution

The technical growth of India has lead not only to medical advancements, but also to an increase in the number of factories. This results in air and water pollution. More energy needs to be produced to power these factories. When fossil fuels are burnt, gases released in the atmosphere. Many cities in India have crossed the limits of suspended particulate matter, sulfur dioxide, and other pollutants due to vehicular and industrial emanation. Reports of the World Bank Organization have shown that Delhi is one of the world's most contaminated cities. As the population increases in future, more forests are cleared. The reasons for deforestation are to make houses for increased number of people to live in, and to use wood as a fuel in the industries. As a result, the trees that facilitate in reducing the air pollution through the process of photosynthesis are not able to do so. Increased air pollution causes many air (polluted) borne diseases. Some of the diseases caused by air pollution are "respiratory diseases, asthma, chronic obstructive pulmonary disease, cardiovascular disease and cancer of the lung" (World Health Organization, Internet). Due to the tropical climate of India, air pollution also causes smog which may result in headaches, dizziness, breathing difficulties, or even mass illness due to carbon monoxide. The root of all the problems is population increase.

Water Pollution

Water pollution also poses threat to environment through the increasing population. Water is considered the core of life. Nearly 10 percent of the world's population faces constant freshwater shortage. This figure may rise if the population growth is uncontrolled. Due to increase in population, numerous factories are set up. These factories lead to various kinds of pollution, including water pollution. Also, India being an agrarian country, the water pollution also comes from pesticides used for agriculture. Some of the major types of pollutants are petroleum products required for automobiles, cooking, and other such human activities, pesticides and herbicides used for agriculture by the Indian farmers, heavy metals from industries, automobiles'

exhausts and mines, hazardous wastes, excessive organic matter like fertilizers and other organic matter used by farmers, sediments caused by soil erosion produced by strip mines, agriculture and roads and thermal pollution caused by deforestation. One of the typical examples of water pollution in India is the river Ganga. This river is considered sacred. People take holy bath in it for spiritual renewal and drink water from it. But people do not realize that along with washing off their sins in the river, they are also washing off their body wastes, leading to polluting the holy water of the river. Also, cremated and partly cremated bodies are dumped into the river. Although, dumping these bodies is a spiritual act in India among the Hindus, but it contaminate the water. Therefore, when population increases, the number of people dying is also increasing, and it lead to the pollution in the river Ganga. Additionally, the nearby factories and human colonies dump sewage directly into the river. At present the river is so contaminated that some experts believe such water should not even be exposed in nature without being treated. It can be said that when population size is increasing, it results in increased pollution, which in turn is leading to a more hostile environment for human beings themselves.

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Wetlands: Not wastelands

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The inception of the third decade of the third millennium poses a colossal and unprecedented environmental challenge of providing and safeguarding the sources of fresh water to zillions of citizenry. The felt need in balancing the ever increasing needs for food, energy and resources to the burgeoning population and also the seriously threatened and impaired vital functions of our fragile ecosystems is beyond ignorable. There has been a rising global concern on the diminishing freshwater supplies and wanton destruction of the freshwater ecosystems that vanguards our very existence within the planet. This can be more so in countries that lie in the African and Asian subcontinents where the population pressure is huge and the per capita resources are in short supply.

Empirical evidences from research organizations across the globe underline the monumental crisis on the anvil, which world nations and policy makers are trying to bridge. Globally 2.1 billion people may fail to have access to clean, safe drinkable water by 2030. More than 3 million people may perish per annum from scant and contaminated sources of water. India's water crisis is even more daunting than what, rest of the world nations are eyeing to confront.

India's water crisis emanates from a convoluted matrix of population pressure, depleting resources, stagnant or near neo-luddite practices and mindless consumerism. The 2030 Water Resources Group, anchored by the World Bank Group has revealed that India will have only half the water it requires by 2030, if its people continue to consume water as per the current rate of consumption. Conservation of water and its natural sources henceforth gains formidable significance to sustain mankind and wildlife in the planet. It is well known that wetland is an integral and key component of the hydrological cycle to maintain the freshwater supplies across the globe. It is our long-term best-bet for water and food security. The developmental activities seem to be reeling under increasing pressures with a direct threat to wetlands.

Wetlands are distinct ecosystems where water is the principal agent controlling the ecology and therefore the allied flora and fauna. They occur where the water table is at or near the surface of the land, or where the land is covered with shallow water.

Although words such as swamp, marsh and bog have been in common parlance for decades, the collective term wetland came into broad usage only during the late 1960's and early 1970's. Wetlands are classically defined was areas sufficiently saturated by water, where only specially adapted plants can grow. 'Hydrology, hydric soil and hydrophytes' are the conventional defining characteristics of wetlands. Only *hydrophytes*, vegetation that have adapted to grow in areas periodically or permanently saturated with

water thrive in wetlands. Wetland soils are characterized by moisture content higher than average moisture content and are classified as *hydric soils*. The degree or type of water saturation of a region is known as its *hydrology*.

The initial, narrow definitional construct of wetlands have now been broadened to include marsh, fen, peat lands or water bodies, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or saline**,** from mangrove swamps to sub-arctic peat lands under its ambit. In addition, there are human-made wetlands such as farm ponds, aquaculture ponds, salt pans, irrigated agricultural lands, reservoirs, gravel pits and canals that can be classified as wetlands for conservation and restoration efforts.

The Ramsar Convention signed and adopted in 1971 at Iran, holds the beacon in pioneering a framework for national and international cooperation for the conservation and wise use of wetlands and their resources. It takes a broader approach in determining wetlands which come under its mandate and classifies all types of wetlands under 5 broad categories of **marine** (coastal wetlands including coastal lagoons, rocky shores and coral reefs), **estuarine** (including deltas, tidal marshes and mangrove swamps), **lacustrine** (wetlands associated with lakes), **riverine** (wetlands along rivers and streams) and **palustrine** (meaning "marshy" – marshes, swamps and bogs). Whatever, the name assigned to them, the distinguishing feature lies in the ecological interplay between the land and the water, and consequently they partake of the characteristics of both.

Wetlands are among the world's most productive environments. Wetlands house a multitude of species belonging to mammals, reptiles, amphibians, pisces, birds and invertebrate species depending upon the geography, topography and ecological determinants of the region. Wetlands are also important storehouses of plant genetic material. They help conserve the gene pool of a wide variety of commercially important plant species. Rice, for example, which is a common wetland plant species, is a staple diet of more than half of humanity. Ecosystem services provided by the wetlands have been well documented and are continuously updated owing to its improved recognition. They are also one of the most fertile grounds of archaeological research and to study the interactions between physical processes and human actions to throw more light on the intricacies of 'man and nature' relationship.

Increasing demand for water has jeopardized our well being and the environment. Access to nutritious food, clean water, sound health, economic development and geopolitical stability are made less secure by the deterioration of wetlands driven by the abruptly widening gap between demand and supply of water. Even with efforts directed at maintaining water recharge in ecosystems, the capacity of wetlands to deliver benefits to people and biodiversity, including clean and reliable water supplies, shows a decline. Until recently in the late 1950s, wetlands have been considered wastelands and therefore worthless. Their transformation through draining, dredging and infilling seemed a fitting fate for them.

The multiple roles of wetland ecosystems and their value to humanity have been progressively understood and documented only in recent years. With the addition of Khijadia Wildlife Sanctuary in Gujarat and Bakhira Wildlife Sanctuary in Uttar Pradesh, India now has 49 Ramsar sites of international importance, the highest in South Asia. Designating wetlands as ramsar sites brings in policy makers, leaders, funds and directional efforts to conserve and protect such critical ecosystems and the associated flora and fauna. This has also led to large expenditures to restore lost or degraded hydrological and biological functions of wetlands. But taking cognizance of the current rate of deterioration of wetlands and water bodies, nature yearns for more warranted and consistent efforts to improve, innovate and inculcate prudent conservation measures on a significant global scale. Mankind needs a perceptional transition of wetlands from viewing it as a physical entity to a biological entity.

Wetlands continue to be dented by human activities, even in areas that are well recognized as National and International Priorities. 'Nature has everything for the need of mankind, but not for his greed' is a quote that has stood the test of time, even to this date. 'Greed and denial' are two influential states of emotion that govern the existential circadian rhythms of our lives. Our biggest challenges towards a responsible and nature sensitive behavior could arguably be managing greed and mindless consumerism.

Wetland conservation and management require not only an understanding of wetlands, but an appreciation of human perceptions and motivations. There is considerable evidence that humans are incapable of making rational decisions regarding the sustainable use of their own landscapes. Multi-storeyed constructions line up along river beds without due considerations to the riverine ecology and laws that strive for wetland conservation. Rivers and wetlands as sources of water are often seen divorced from each other. As much as water is regarded as a resource or good, public policies that aim to ensure water and food security tends to turn a blind eye to the fact that water is an inherent part of natural ecosystem, for which supply and recharge have to go hand in hand. Efforts at engineering water systems are thus efforts at augmenting water supply rather than strengthening the capacities of ecological systems.

In the case of wetlands like ponds, lakes and lagoons, the contestations are fiercer. Who owns the wetland is a common predicament and what happens to the wetland also depends on this ideation. Research findings show that Asia's largest freshwater oxbow lake, the Kanwar Lake in Bihar, has shrunk to one-third of its size due to encroachment, much like Jammu and Kashmir's Dal Lake. The metropolitan city of Bengaluru would run water scarce, if its existing wetlands and other water bodies aren't respected. Water sources like streams, which eventually feed water into lakes, also get cut off due to unplanned urbanization. The political pressure to usurp water and wetlands as mere land is high and for this reason, states have failed to secure perimeters and catchment areas or notify adequate number of wetlands.

There is a set of causal factors that create wetlands. These produce measurable properties in wetlands. Our responsibility is to determine the ecological relationships

and convey effectively to the masses around us to ensure that wetlands are conserved and managed wisely. The future will certainly require continued efforts in both research and conservation, if we are to succeed in understanding and protecting the world's wetlands. Sustainability cannot be reached without ecology. For a country like India, which is both seasonally water rich and water scarce, collective responsibility from leaders, organizations, action groups and its people should be mooted above all prejudices.

Figure 1: The World's largest Wetlands - Pantanal wetlands of Brazil. PHOTO: ADARSH PRATHAP, KERALA.

Figure 2: Ecotourism Service provided by the wetlands. PHOTO: ADARSH PRATHAP, KERALA.

Figure 3: Wetlands (Riverine Marsh) provide breeding ground for several species of avifauna. PHOTO: ADARSH PRATHAP, KERALA.

Figure 4: The Riverine Marsh Wetlands of Kerala. PHOTO: ADARSH PRATHAP, KERALA.

वन रोपणी एंव रोपण में व्हाइट ग्रब एवम् दीमक का प्रकोप एवं उसका नियंत्रण

मोहन सी. एवं आर. के. मालवीय

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जबलपुर

व्हाइट ग्रब, *होलोट्रिकिया* प्रजाति एवं उसका नियंत्रण

यह कीट गण कोलियोप्टेरा, कुल स्कैरेबिडी के अन्तर्गत आते हैं । भारत वर्ष में इनकी कई प्रजातियाँ पायी जाती हैं परन्तु वानिकी में निम्न प्रजातियाँ प्रमुख हैं -

1. होलोट्रेकिया कोनसेनगुनिया
2. होलोट्रेकिया इनसुलेरिस
3. होलोट्रेकिया सेराटा
4. होलोट्रेकिया प्रोबलेमेटिका
5. होलोट्रेकिया रस्तिका
6. होलोट्रेकिया म्यूसिडा
7. शाइजीनिखा रुफिकोलिस

इस कीट का प्रकोप मध्यप्रदेश, महाराष्ट्र, उत्तर प्रदेश, गुजरात, तामिलनाडु में सबसे अधिक होता है क्योंकि इन स्थानों पर सागौन के रुट-शूट के उत्पादन का कार्य बड़े पैमाने पर होता है तथा इस हेतु पौधों को ऊंचे उठाकर बनाए हुए बेड्स (Raised beds) में लगाया जाता है ।

पहचान

इस कीट की इल्ली जिसे ग्रब कहते हैं यह सफेद क्रीम रंग की अंग्रेजी के 'सी' अक्षर की तरह होती है । यह जमीन में 8-30 से.मी. गहराई में तथा कभी-कभी 94 से. मी. गहराई में भी पायी जाती हैं । अंडे से निकली हुई इल्ली या ग्रब की लम्बाई 1.3 से 6.0 मि. मी. तक होती है । जो कम सड़ी हुई पत्तियों या जड़ों को खाती हैं, जैसे-जैसे यह बड़ी होती हैं तो यह पौधों के जीवित जड़ों को भी खाना शुरु कर देती हैं । प्रत्येक इल्ली अपने जीवनकाल में 32.33 से 60 मि. मी. तक बड़ी होती हैं । अक्टूबर माह के उपरान्त इल्ली या ग्रब मिट्टी में अंडेकार प्यूपल घर बनाता है जिसमें यह प्यूपा या डिम्भ अवस्था में 3-4 सप्ताह रहकर वयस्क में बदल जाता है। वयस्क वर्षाकाल तक जमीन के अन्दर सुसुप्त अवस्था में रहता है, पहली वर्षा के बाद यह वयस्क बाहर निकल आते हैं । इसके वयस्क साल, तेंदू, पलास, बेर एवं अन्य पौधों की पत्ती को खाते हैं और जून के अंतिम सप्ताह में रात्रि में बेडों से बाहर आकर पोषक पौधों की पत्तियों को खाते हुए प्रजनन करते हैं तथा सूर्योदय के पूर्व पुनःये खुदी हुई जमीन या भुरभुरी मिट्टी में घुसकर सफेद क्रीम रंग के अंडाकार अंडे देते हैं। ये अंडे एक सप्ताह बाद कुछ

बड़े हो जाते हैं जिनसे सफेद रंग की छोटी इल्ली या ग्रब निकल आती है।

क्षति की प्रकृति

अंडों से निकली इल्ली (ग्रब) पौधों की छोटी जड़ों व मुख्य जड़ तथा कंद (राइजोम) को खा जाते हैं। जिसके कारण पौधा मुरझाकर गिर जाते हैं एवं मर जाता है। इसका प्रकोप वर्षा के समय जून से सितम्बर माह तक होता है।

जीवन चक्र

इस कीट की वयस्क मादा मिट्टी में अलग-अलग 3 इंच तक की गइराई में अंडे देती है। यह रेतीली मिट्टी में अंडे देना अधिक पसन्द करती है। इसके अंडे क्रीम रंग के होते हैं। अंडे से इल्ली निकलने में 7 से 10 दिन लग जाते हैं। इल्लियाँ जून के अंतिम सप्ताह से सितम्बर-अक्टूबर तक पाये जाते हैं जो इसके बाद प्यूपा अवस्था में चले जाते हैं। इसका जीवन चक्र एक वर्ष का होता है।

नियंत्रण के उपाय

1. इस कीट के वयस्क रेतीली व भुरभुरी जमीन में अंडे देने हेतु आकर्षित होते हैं अतः रेतीली मिट्टी में रोपण न किया जाय तथा वर्षा में गुड़ाई न की जाय उपरोक्त विधि को अपनाने से वयस्क कीटों के अंडे देने की संभावना घट जाती है।
2. मानसून की पहली बौछार से अगस्त माह तक प्रकाष पिजरों (लाईट ट्रेप) की सहायता से रात्रि में वयस्क कीटों को एकत्र कर उन्हें मिट्टी के तेल (केरोसिन) मिले पानी में डुबोकर मार देना चाहिए जिससे वयस्क अंडे देने वाले कीटों की संख्या कम हो जाती है।
3. जुलाई के प्रथम सप्ताह में फोरेट (थिमेट) 10 जी 200 ग्रा. दवा प्रति क्यारी (10 मी x 1 मी) की दर से मिट्टी में मिलायें।

व्हाइटग्रब की इल्ली व वयस्क

सागौन के क्षतिगस्त्र पौधे

दीमक एवं उसका नियंत्रण

यह कीट विश्व के सभी गर्म एवं आर्द्रता वाले देशों में पायी जाती हैं। भारतवर्ष इससे अछूता नहीं है। जहॉ पर यह नहीं पायी जाती हैं यह सभी कीटों से ज्यादा नुकसान पंहुचाती हैं। इस कीट का प्रकोप रोपणी में सबसे ज्यादा होता है। यह 1 - 3 साल के पौधों को सबसे ज्यादा हानि पंहुचाती हैं, कभी-कभी यह रोपणी के सभी पौधों को नष्ट कर देती है। इनका प्रकोप पूरे वर्ष रहता है।

प्रजाति

नीलगिरी (यूकेलिप्टस), पापलर, बांस, सागौन, साल

पहचान

यह कीट सफेद क्रीम रंग की होती हैं। इसका सिर हल्का लाल एवं काले रंग का होता है। यह मिट्टी की बाम्बी बनाकर समूह में रहती हैं। वयस्क दीमक बरसात के समय समूह में उड़ते हुए दिखाई देती हैं। वयस्क दीमक के पंख पारदर्शी होते है।

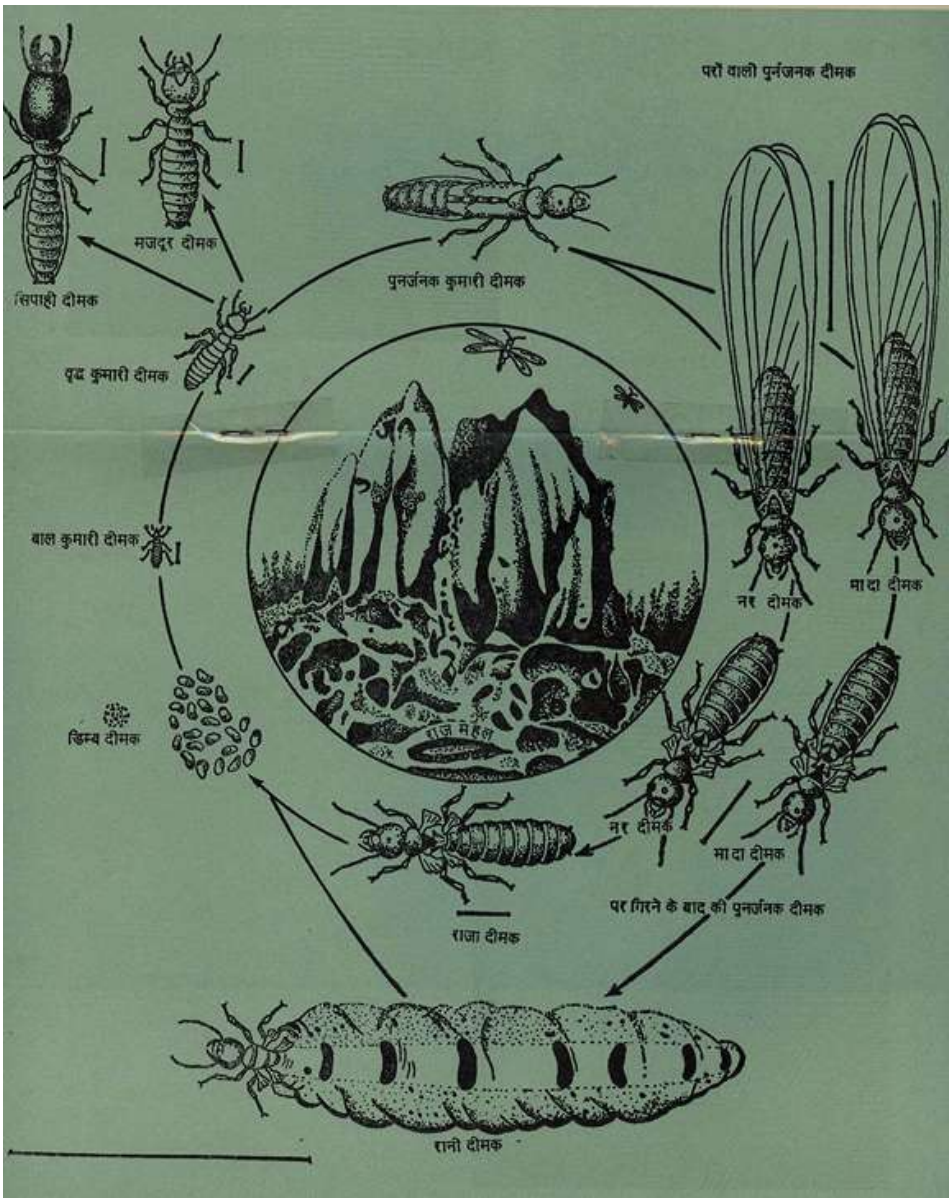
क्षति की प्रकृति

इनका मुख्य भोजन सेलुलोज, स्टार्च एवं शुगर है। मुख्य भोजन उपलब्ध न होने पर यह पौधों के किसी भी हिस्से को खाकर जीवित रह सकती हैं। दीमक रोपणी में अधिकतर पौधों की जड़ों तथा पेड़ों की छाल को नुकसान पंहुचाती है। ये जड़ों को नीचे से ऊपर की ओर खाती हैं। जिससे पौधे मुरझाकर सूखने लगते हैं। पौधे को हाथ से ऊपर खींचने पर पौधों के साथ-साथ दीमक भी बाहर आ जाती हैं। इस कीट की कई प्रकार की प्रजातियाँ पाई जाती हैं जिसमें मुख्य रुप से ओडोन्टोटरमस व माईक्रोटरमस सबसे अधिक पौधों को हानि पंहुचाती है।

जीवन चक्र

यह जमीन में कालोनी बनाकर रहने वाले सामाजिक कीट है। इनमें आपस में उत्तम प्रकार का तालमेल होता है। इनका कार्यो के आधार पर वर्गीकरण होता है। यह तीन प्रकार की होती हैं, मजदूर, सिपाही और प्रजनन करने वाली दीमक जो रानी कहलाती हैं। मजदूर दीमक ही पौधों को नुकसान पंहुचाती है। सिपाही दीमकें इनकी रक्षा में इनके साथ-साथ चलती है। एक कालोनी में एक ही रानी दीमक होती है, जो प्रजनन कार्य करती है। एक रानी दीमक एक दिन में लगभग 30 हजार तक अंडे देती है। वर्षा के दिनों में बाम्बी से बाहर निकलकर उड़ते हुए दिखाई देती हैं। जो भविष्य के राजा-रानी हैं यह नया जोड़ा बनाकर नई कालोनी का निर्माण करती है। एक बस्ती में लगभग 1 लाख दीमकें रहती हैं। इनमें सबसे ज्यादा मजदूर दीमकें होती हैं।

दीमक का जीवन चक्र



नियंत्रण के उपाय

1. रोपण हेतु स्वस्थ पौधों को प्रयोग में लाना चाहिए।
2. गोबर की अच्छी सड़ी खाद ही प्रयोग में लाना चाहिए।
3. रोपणी तैयार करते समय दूसरे पेड़ पौधों के जड़ एवं पत्तों को जलाकर नष्ट कर देना चाहिए।
4. रोपणी के आसपास की बाम्बियों को सब्बल से तोड़कर विषयुक्त दवा क्लोरपारिफॉस 5 मि.ली. दवा प्रति लीटर पानी में मिलाकर 80-100 ली. घोल प्रति बाम्बी के हिसाब से डालने से उनके विस्तार को कम किया जा सकता है।
5. मिट्टी में फोरेट 10 जी दवा 150 ग्राम की दर से हर बेड (साइज 10 x 1 मी.) जून-जुलाई में मिलाने से इनको नष्ट किया जा सकता है।
6. इन्डोसेल 0.1% (142.86 मि ली दवा 5 लीटर पानी में घोलकर) या क्लोरोपायरीफांस 0.1% (250 मि ली दवा 50 लीटर पानी में घोलकर) 1 x 10 मी. साइज की क्यारी में उचित मात्रा में डालकर मिट्टी को भिगा दें।
7. पोलीथीन थैली में, इन्डोसेल 0.1% को घोलकर (2.86 मि ली दवा प्रति लीटर) 20 थैली प्रति लीटर के अनुसार से भिगा दें।
8. पेड़ों की छाल पर प्रकोप के लिए इन्डोसेल 0.1% का छिड़काव करें।
9. रोपणी में 300 गाम इन्डोसेल 4 डी पी की पाउडर को 10 से.मी. जमीन की गहराई तक मिट्टी में 1 x 10 मी की प्रति क्यारी के अनुसार मिलायें।
10. 250 से 300 ग्राम इन्डोसेल 4 डी पी की पाउडर को प्रति पेड़ मिट्टी में 10 से 15 से.मी. जमीन की गहराई तक मिलायें।

सागौन वृक्षारोपण की तकनिकी जानकारी एवं आयसृजनका एक संभावित स्रोत

विशाल वर्मा और निशा कुमारी

आनुवंशिकी और वृक्ष सुधार प्रभाग
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परिचय

सागवान को सामान्यत सागौन, सागवान, साक के नाम से भी जाना जाता है व इसका अंग्रजी नाम टीक (Teak) एवं साइंटिफिक नाम टेक्टोना ग्रांडीस (Tectona grandus) है। सागवान उष्ण कटिबंधीय वृक्ष प्रजाति है जो कि लैमिएसी

परिवार से संबंधित है। यह भारत का एक मूल्यवान एवं ऊंची कीमत वाली टिम्बर की वृक्ष फसल है। यह एक लम्बा पतझड़ी वृक्ष है, जिसकी ऊँचाई 30-40 मीटर तक लम्बी और टहनियां स्टेली-भूरे रंग की होती है। भारत में सागौन की खेती पहली बार 1842 में शुरुआत की गई और चाटू मेनन को भारतीय टीक की खेती के पिता के तौर पर जाना जाता हैं। यह एक महत्तवपूर्ण कठोर लकड़ी है और इसका प्रयोग मुख्यतः फर्नीचर, प्लाइवुड, कंस्ट्रक्शन के लिए प्रयोग किये जाने वाले बढ़े खम्भे और जहाज निर्माण के लिए किया जाता है। इसके उत्पादन में रिस्क कम और अच्छा आर्थिक लाभ होता है।

सागौन भारत, बर्मा, और थाईलैंड में अधिक क्षेत्र में है, साल में 30 इंच से अधिक वर्षा वाले और 25°-27° से. तापमान वाले स्थानों में यह अच्छा पनपता है। इसके पेड़ साधरण 100 से 150 फुट ऊँचे और गोलाई 3-8 फुट व्यास के होते है। छाल आधा इंच मोटी, धूसर या भूरे रंग की होती है। इनका रसकाष्ठ सफेद और अन्तः काष्ठ हरे रंग का होता है। सालो के बाद भी सागौन की लकड़ी अच्छी अवस्था में पाई गई है। सागौन के अन्तः-काष्ठ को दीमक आक्रमण नही करती लेकिन रस काष्ठ को अपने भोजन में उपयोग करती है। भारत के ट्रावनकोर, कोचीन, मुद्रास, कुर्ग, मैसूर,

महाराष्ट्रा, और मध्यप्रदेश के जंगलो से सागौन की उत्कृष्ट काष्ठ प्राप्त होती है। सागौन पहले बर्मा से पर्याप्त मात्रा में भारत आता था, लेकिन अब भारत से ही निर्यात किया जाने लगा है।

मध्य प्रदेश में सागौन की खेती को बढ़ावा देने एवं किसानो की आय को बढाने के लिए उष्णकटिबंधीय वन अनुसंधान संस्थान के आनुवंशिकीय और पादप प्रजनन प्रभाग, में अनुसंधान कार्य द्वारा कई परियोजना भी चलाई जा रही है सागौन के उन्नत बीज एवं पौधे सरकारी नर्सरी कृषि विश्वविद्यालय, उष्णकटिबंधीय वन अनुसंधान संस्थान जबलपुर या राज्य वन अनुसंधान जबलपुर द्वारा प्रदान किये जाते है।

सागौन का औषधिय उपयोग

पत्र, बीज, छाल तथा मूल का प्रयोग कमजोर पाचन में, साप काटने पर, पथरी के इलाज में, बालो के लिए, दाद खाज खुजली में, सिर दर्द में सूजन आदि में सागवान का उपयोग होता है।

जलवायु

पेड़ के लिए उचित जलवायु आदि की जाँच करना आवश्यक है, अगर आप सागवान की खेती करना चाहते है तो नमी एवं उष्णकटिबंधीय क्षेत्र उत्तम होता है इसके उत्तम विकास के लिए तापमान 45-10° C वर्षा 1200-2500 mm, बुवाई का तापमान 30-35° C, कटाई का तापमान 10-45°C होना चाहिये। सागौन पेड़ अधिक तापमान को बड़ी आसानी से सहन कर सकता है।

सागौन के लिए मिट्टी

बढ़िया विकास के लिए, बढ़िया निकास वाली, घनी और उपजाऊ मिट्टी की आवश्यकता होती है। भूमि की पहले गहरी जुताई करे और उसमे जैविक खाद या गोबर खाद मिलाकर तैयार करे। इसके लिए मिट्टी का pH 6.5 या इससे ज्यादा होना चाहिए। मिट्टी की pH 6.5 से कम होने पर फसल के विकास पर असर पड़ता है।

प्रसिद्ध किस्मे और पैदावार

कोंनी टीक, वेस्ट अफ्रीकन टीक, गोधावारी टीक, साउथ एंड सेंट्रल अमेरिकन टीक, नीलाम्बुर और मालाबार टीक।

सागौन के लिए भूमि

सागौन की खेती के लिए मिट्टी का चयन करना बेहद आवश्यक है सागौनकी खेती करना चाहते है तो इसके लिए जलोढ़ मिट्टी सबसे उत्तम मिट्टी है।

जमीन की तैयारी

मिट्टी के भुरभुरा बनाने के लिए खेत की 2-3 बार जोताई करें। मिट्टी को समतल करें ताकि खेत में पानी खड़ा ना हो सके। नए पौधों की रोपाई के लिए 45×45×45 सैं.मी. के फासले पर गड्ढे खोदे।प्रत्येक गड्ढे में गली हुई रूड़ी की खाद के साथ कीटनाशी डालें।

सागौन के लिए आवश्यक सिंचाई

शरुआती दिनों में पौधे की बढवार के लिए अति आवश्यक है। खरपतवार नियंत्रण के साथ-साथ सिंचाई भी चलती रहनी चाहिए। तीन साल तक हर महीने पानी देना चाहिए और अगस्त और

फरवरी महीने में दो बार खाद डालना चाहिए। लगातार तीन साल तक प्रत्येक पौधे में 50 ग्राम अमोनियम सल्फेट, डी.ए .पी. और पोटाश का मिश्रण डाला जाना चाहिए। नियमित तौर पर सिंचाई और पौधे की छंटाई से तने की चौड़ाई बढ जाती है। ये सब कुछ पौधे के लिए शीर्ष भाग के विकास पर निर्भर करता है वही, अच्छी गुणवत्ता वाले पेड़ के लिए साल में चार महीने सूखा मौसम चाहिए और इस दौरान 60 एमएम से कम बारिश ही अच्छी होती है। पेड़ के बीच अंतर, तने की काट-छाट से कम बारिश ही अच्छी होती है। पेड़ के बीच अंतर, तने की काट- छाट से पौधे के विकास पर फर्क पड़ता है। काट-छांट में अगर देरी की गई या फिर पहले या ज्यादा काट-छांट की जाती है तो इससे भी इसकी खेती पर बुरा प्रभाव पड़ता है।

नर्सरी में सागौन पौधा रोपण

नर्सरी में सागौन पौधा रोपन सागौन की नर्सरी के लिए हल्की ढाल युक्त अच्छी सूखी हुई बलुई मिट्टी वाला क्षेत्र जरूरी होता है। नर्सरी की एक क्यारी 1.2 मीटर की होती है। इसमे0.3 मी.से 0.6मी.की जगह छोड़ी जाती है। साथ ही क्यारियों की लाइन के लिए 0.6 से 1.6 मी. की जगह छोड़ी जाती है। एक क्यारी में 400-800 तक पौधे पैदा होते हैं। इसके लिए क्यारी की खुदाई होती है। इसे करीब 0.3 मी. तक खोदा जाता है और जड़, खूंटी और कंकड़ को निकाला जाता है। जमीन पर पड़े ढेले को अच्छी तरह तोड़ कर मिला दिया जाता है। इस मिट्टी को एक महीने के लिए खुला छोड़ दिया जाता है और उसके बाद उसे क्यारी में बालू और ऑर्गेनिक खाद के साथ भर दिया जाता है। नमी वाले इलाके में जल जमाव को रोकने के लिए जमीन के स्तर से क्यारी को 30 सेमी तक ऊंचा उठाया जाता है। सूखे इलाके में क्यारी को जमीन के स्तर पर रखा जाता है। खासकर बेहद सूखे इलाके में जहां 750 एमएम बारिश होती है वहां पानी में थोड़ी डूबी हुई क्यारियां अच्छा रिजल्ट देती है। एक मानक क्यारी से जो कि 12 मी. की होती है उसमे करीब 3 से 12 किलो बीज इस्तेमाल होता है। वहीं, केरल के निलांबुर में करीब 5 किलो बीज का इस्तेमाल होता है।

सागौन की बिजाई

बीज बुआई का समय

बीजों को नर्सरी बैड में बोया जाता है। रोपाई के लिए 12-15 महीने के नए पौधों का प्रयोग करें। टिशू प्रजनन ग्राफ्टिंग, जड़, तने काट कर और सूक्ष्म प्रजनन द्वारा किया जाता है। रोपाई के लिए पूर्व अंकुरन पौधों का प्रयोग किया जाता है। मॉनसून का मौसम सागवान की रोपाई के लिए सबसे अच्छा मौसम होता है।

फासला

रोपाई के लिए 2×2 या 2.5×2.5 या 3×3 मीटर के फासले रखा जाता है। जब अंतर-फसली अपनाई हो, तो 4×4 मीटर या 5×5 मीटर फासला रखें।

बीज की गहराई

सागौन की रोपाई के लिए पूर्व अंकुरित पौधों का प्रयोग करें। 45×45×45 सैं.मी. के गड्ढे बनाएं । प्रत्येक गड्ढे में गली हुई की खाद और मिट्टी डालें।बीज की बुआई पंक्ति में, छींटे द्वारा या पनीरी लगाकर की जा सकती है ।

सागौन के लिए बीज

बीज की मात्रा

एक एकड़ में रोपाई के लिए लगभग 1500-1800 क्लोनस का प्रयोग करें।

बीज का उपचार

सागौन वृक्ष के फल का छिल्का मोटा और सख्त होता है, इसलिए नर्सरी में बिजाई से पहले सागौन के बीजों की अंकुरन प्रतिशतता बढ़ाने के लिए बीजों का पूर्व उपचार किया जाता है। फलों को भिगोने और सुखाने के लिए पूर्व उपचार का पारंपरिक ढंग प्रयोग किया जाता है। इस विधि में बीजों को 12 घंटे के लिए पानी में भिगोया जाता है और फिर 12 घंटे के लिए धूप में सुखाया जाता है। यह प्रक्रिया 10-14 दिनों तक बार बार दोहराई जाती है। बीजों के उपचार के लिए अन्य तेजाबी और गड्ढा वाले पूर्व उपचार के ढंग हैं।

खाद

हर साल अगस्त और सितंबर महीने में N:P:K (15:15:15) @ 50 ग्राम प्रति पौधे में पहले तीन वर्ष डालें। फास्फोरस, पोटैशियम, कैल्सियम, नाइट्रोजन और ओर्गनिक तत्व से भरपूर मिट्टी सागवान के लिए बहुत आवश्यक है।

खरपतवार नियंत्रण

पहले तीन वर्षों में खेत को नदीन मुक्त करना आवश्यक है। नियमित समय पर गोड़ाई करें । पहले वर्ष में 3 और दूसरे वर्ष में 2 गोड़ाई करें । रोपाई के तीसरे वर्ष में एक बार गोड़ाई करें ।

सागौन में अंतरवर्तीय फसल

जहाँ कृषि योग्य भूमि है वहा शुरू के दो साल के दौरान सागौन की खेती के बीच में अंतरवर्तीय फसल उगाई जाती है। सागौन की खेती के बीच

में आमतौर पर गेंहू, सोयाबीन, तिल, और मिर्च के साथ-साथ सब्जी की खेती की जाती है ।

सागौन की खेती का प्रबंधन

पौधे की देखभाल

हानिकारक कीट और रोकथाम

पत्तों की भुंडी और काली सुंडी सागवान के वृक्ष के गंभीर कीट है जो कि भारी मात्रा में वृक्ष को नुकसान पहुंचाते हैं। इस कीट की रोकथाम के

लिए क्विनलफॉस 300 मि.ली. को 150 लीटर पानी में मिलाकर स्प्रे करें ।

बीमारियां और रोकथाम

गुलाबी बीमारी, पत्तों पर सफेद धब्बे और जड़ गलन सागवान के पौधे की मुख्य बीमारियां हैं। इसकी रोकथाम के लिए एम-45@400 ग्राम की प्रति एकड़में स्प्रे करें।

फसल की कटाई

जब वृक्ष कटाई की अवस्था पर पहुंच जाये तब उस वृक्ष को निशान लगायें और इसकी रिपोर्ट चीफ रीजनल फोरैस्ट्री ऑफिस में दें। अनुमति मिलने के बाद कटाई की जा सकती है। सागौन की खेती सबसे ज्यादा लाभदायक होती है क्योंकि इसकी भारत के साथ साथ विदेशों में भी भारी मांग है। एक 14 वर्ष का सागवान का वृक्ष 10-15 घन फीट की लकड़ी प्रदान करता है।

सागौनका उत्पादन

15-20 साल के दौरान एक सागौन का पेड़ 17-25 क्यूबिक प्रति लकड़ी देता है। सागौन का मुख्य तना आमतौर पर 25-50 फीट ऊँचा होता है और करीब 35-45 इंच मोटा होता है। एक एकड़ में उन्नत किस्म के करीब 540 सागवान का पेड़ पैदा होता है। इसके लिए पौधा रोपण के दौरान 8 फीट का अंतराल रखना जरुरी होता है।

सागौन से लाभ

टिस्सू कल्चर सागवान के पौधे के बिच दुरी 8×10 फिटरखते है तो प्रति एकड़ 520 से 540 पौधे लगेगे और उन्हें प्रति पौधा अनुमानित उत्पादन 17-25 घन फीट होता है। जिसका बाजार मूल्य लगभग प्रति घन फीट 2000 रूपये है इस प्रकार 15-20 सालो के बाद प्रति एकड़ कुल आय लगभग दो करोड़ के लगभग हो सकती है।

सागौन से आय व कीमत

सागौन का पौधा प्रयोगशाला में टिस्सू कल्चर तकनीक द्वारा भी तैयार किया जाता है। टिस्सू कल्चर सागवान पौधा रोग व कीटाणु से मुक्त होता है। इसके बढ़वार जल्दी व पौधों में एकसमान दिखने को मिलता है। इसकी मुख्य शाखा मजबूत व सीधी होती है। इसे किसी भी मौसम में लगाया जा सकता है लेकिन पौध लगाने के बाद समय पर सिंचाई के साथ-साथ देखभाल जरुरी है। इस पौधे से 12-15 सालो में लकड़ी मिलनी शुरू हो जाती है। लकड़ी मजबूत व सुनहरी पीली और उच्च गुणवत्तायुक्त होती है।सागौन के साथ-साथ दूसरी फसल भी संभव है यह बिल्कुल संभव है अगर सागौन के साथ-साथ कोई भी फसल लगाना चाहते हैं तो इसकी दूरी 12 होनी चाहिए इसके अलावा इसको हम खेत की मेड में भी लगा सकते हैं 1 एकड़ की लंबाई 200 चौड़ाई 220 होता है जिस पर करीब डेढ़ सौ पौधे लगाए जा सकते हैं लेकिन खेत की मेड पर पौधे पांच फीट की दूरी पर लगाते हैं यानी आप अपनी प्रमुख फसल के साथ सागवान के फसल का भरपूर लाभ उठा सकते हैं डेढ़ सौ पेड़ ₹40000 पौधे के हिसाब से 8 से 10 साल में

₹600000 आराम से देकर जाते हैं सागौन की कॉन्ट्रैक्ट फार्मिंग करने वाली कंपनियां औसत कीमत 35 से ₹4000 क्यूबिक फीट का रेट वर्तमान में दे रही है एक पेड़ में 20 से 22 क्यूबिक फीट लकड़ी निकल जाती है या नहीं एक पेड़ की कीमत अगर हम 20 घनफुट लकड़ी भी पकड़े और ₹2000 घन फीट की दर से भी बेच देते हैं तो आराम से ₹40000 की होती है इस हिसाब से 1 एकड़ में 1000 पौधे लग जाते हैं और हजार पौधे की कीमत 1000 गुण थे 40 बराबर 4 करोड कम से कम 8 से 10 साल में होती है यह पौधे 8 से 10 साल में पूर्णता तैयार हो जाते हैं और पेड़ की गोलाई 8 से 10 साल में 3 फीट 36 इंच और लंबाई 40 से 45 फीट हो जाती है इससे इस अवस्था में बेचने लायक समझा जा सकता है।

सागौन की मार्केटिंग

सागौन के लिए बाजार में बेहद मांग है और इसे बेचना भी बेहद आसान है। इसके लिए बाय बैक योजना के आलावा स्थानीय टिंबर मार्केट भी होते है। घरेलु और अन्तराष्ट्रीय बाजार में बेहद मांग होने की वजह से सागौन की खेती बेहद फायदेमंद है।

सागौन के बीज या पौधे सरकारी नर्सरी कृषि विश्वविद्यालय, उष्णकटिबंधीय वन अनुसंधान संस्थान जबलपुर या राज्य वन अनुसंधान जबलपुर से लिए जा सकते है।

सन्दर्भ

वन अनुसंधान संसथान (सम विश्वविद्यालय) देहरादून उत्तराखंड ।

डॉ.यशवंत सिंह परमार हॉर्टिकल्चर एवं फॉरेस्ट्री विश्वविद्यालय, नैनी, सोलन (हिमाचल प्रदेश) ।

भारतीय वानिकी अनुसंधान एवं शिक्षा परिषद, पर्यावरण, वन और जलवायु परिवर्तन मंत्रालय ।

फारेस्ट विभाग ।

Perciana flavifusa - A major insect pest of *Grewia optiva*

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Abstract

Grewia optiva J.R. Drumm. ex Burret, commonly called as the Bhimal, is a multipurpose tree from India and mainly used for fodder and fuel. The present article deals with the pest profile of *Perciana flavifusa* Hampson (Lepidoptera : Noctuidae), which is a major insect pest of *G. optiva*, both in nursery and plantation.

Key words: *Grewia optiva*, *Perciana flavifusa*, major insect pest.

Introduction

Grewia optiva J.R. Drumm. ex Burret (syn. *Grewia oppositifolia* Buch.-Ham. ex Roxb.) (family Malvaceae), commonly known as the bhimal, is a species of flowering plant, native to the Indian subcontinent (https://en.wikipedia.org /wiki / Grewia_optiva). This species is a medium sized, multipurpose tree, which produces nutritious leaf fodder, fuel wood and fibre (Anon, 1972; Singh and Nautiyal, 1993; Bora and Borgohain, 1994). G. optiva is widely distributed in the mixed deciduous forests of the outer Himalayan ranges, from Punjab to West Bengal (Joshi and Narain, 1992). It is one of the few outstanding fodder species and very popular for feeding productive animals throughout the western Himalaya (Negi, 1986). G. optiva has been identified as one of the suitable promising species for Agroforestry and Social Forestry (Singh, 1982; Sidhu, 1986).

Overview of insect pests

Perusal of literature on insect pests of *G. optiva* reveals that this species has a very few pest problems (Joshi and Narain, 1992) and a few number of insects have been reported (Mathur and Singh, 1960). It has been reported that the larvae of *Diacrisia* species and *Chasmina tibialis* defoliate the tree while the larvae of the family Cerambycidae bore in dead and dry wood (https://apps.worldagroforestry.org/ treedb/AFTPDFS/Grewia_optiva.PDF). According to Sharma and Sood (2009), insect pests found feeding on leaves of *G. optiva* are *Mimastra cyanura*, *Myllocerus setulifer*, *Apoderus* species, *Lygropia obrinusalis* and *Adoretus bimarginatus* in Solan district of Himachal Pradesh. Sharma (2013) has recorded along with chaffer beetles severe damage of *G. optiva* by *Lygropia obrinusalis*, *Apoderus* species, Mimastra *cyanura*, *Myllocerus cellulifer* and *Asiosilis* species. In addition, Roychoudhury et al. (1996) have recorded *Perciana flavifusa* Hampson (Lepidoptera: Noctuidae), for the first time feeding on *G.optiva*. . The present article deals with the pest profile of this defoliator, *P. flavifusa* which is a major insect pest of *G. optiva* in nursery and plantation.

Pest profile

Perciana flavifusa Hampson (Lepidoptera: Noctuidae)

The adult moth lay eggs on young leaves. Early instars feed on young leaves whereas later instars prefer mature leaves and consume the entire leaf except midrib. The semi-looper caterpillars are about 31-35 mm in length when full grown, pale green to dark green in clour with two lateral white lines on the dorsal side of the body and two lateral black bamds (Roychoudhury et al., 1996). Pre-pupae are pale green in colour and pupae are dark brown, obtect and nacked. Pupation occurs in the soil and puapal period is 7-9 days. The moths are nocturnal and medium sized. Hampson (1984) collected the adult moth of this insect from Manipur and determined as a new species. The diagnostic features of male moths are head reddish brown, thorax and abdomen grey and fuscous, fore wing grey, slightly irrorated with black, the basal area suffused with pale yellow, the outer with brown, the orbicular minute, the reniform

Fig.1. Adult moth of *Perciana flavifusa*

large with a line from it to inner margin, traces of a dentate submarginal line and hind wing pale fuscous (Fig. 1). Wing expansion varies from 28-30 mm.

P. flavifusa starts appearing with the onset of rainy season (June-July) and cause serious damage of G. optiva by defoliating the leaves. The infestation caused by the larvae of this insect pest is very serious and percentage incidence varies from 90-95%, both in nurseries and plantations.

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